

Reading

1 Read this article that appeared in *New Scientist*. Time yourself as you read.

⌚ about 500 words

WRAPPERS SMARTEN UP TO PROTECT FOOD

Active packaging will tell you instantly if your groceries are fresh.



Unwrapping your shopping to find you have bought mouldy bread, rotten fruit and sour milk could soon become a thing of the past, thanks to a range of emerging 'active packaging' technologies. While conventional packaging simply acts as a barrier that protects food, active packaging can do a lot more. Some materials interact with the product to improve it in some way, or provide better information on the state it is in. For instance, they may soak up oxygen inside a wrapper to help prevent food spoilage or show whether potentially dangerous foods like red meat and chicken have been stored at unsafe temperatures.

One of the new breed of packaging technologies that has just gone on the market in France is a 'time temperature indicator'. Stores where the product has already been introduced report that far fewer consumers are returning spoilt food. The indicator is basically a label that tracks the temperature a package has been kept at and for how long. The label has a dark ring around a lighter circle. The central ring contains a chemical which polymerises, changing colour as it does so from clear to dark. If the package stays

cool, the reaction is slow, but increasing the ambient temperature speeds up the polymerisation. When the inner circle darkens, it means the product is no longer guaranteed fresh.

Other indicators are being developed to monitor the gases being given off inside frozen-food packages, causing deterioration – perhaps because of a freezer breakdown. The National Center for Toxicological Research in Arkansas, USA, has developed a plastic disc impregnated with a dye that sits inside food packaging and changes colour if gases produced by decay are present.

Smart packaging can also control the atmosphere inside a container. For instance, the make-up of oxygen (O_2) and carbon dioxide (CO_2) within packaged vegetables will influence their freshness. This can be hard to control in a sealed package, since vegetables consume more oxygen and give off more carbon dioxide as the package gets warmer. A firm in California is trying to solve the problem with a membrane wrapper it calls 'Intelimer', which changes its permeability as the temperature changes in a way that keeps different products at their optimal O_2/CO_2 concentrations.

Decay can also be decelerated by controlling the environment inside a package with an 'oxygen scavenger'. Currently, this is achieved by placing a sachet filled with iron powder in the package – any oxygen in the package is consumed by the iron as it oxidises. However, consumers don't like finding sachets marked 'Don't eat' in their food, so a company in New Jersey is making a wrap that itself scavenges oxygen. The material includes an inner layer of an oxidisable polymer that traps oxygen in the same way as iron.

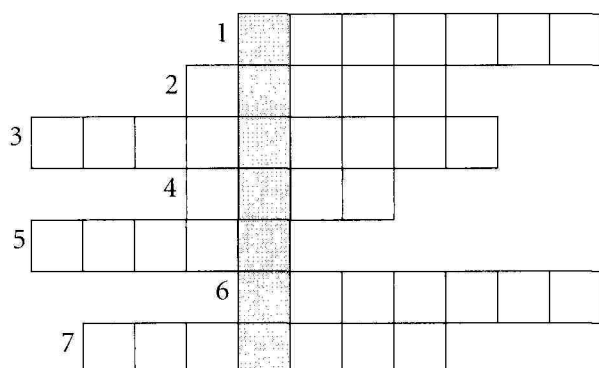
It is predicted that between 20 and 40 per cent of all food packaging will soon be active.

- 2 Complete the sentences with one or two words from the passage. Remember to check your spelling. TF4
- Active packaging offers far more benefits than kinds, which merely cover food up.
 - New wrapping materials are being developed to whatever they are covering, for the benefit of the consumer.
 - A recently developed device that alerts consumers to a product's storage profile is triggered by the rate of a chemical
 - In the event of mechanical failure in storage, one new product that is a colorant can reveal whether food is rotten.
 - The key to keeping packaged vegetables at their best lies in of oxygen and carbon dioxide.
 - One innovative type of wrapping has an which absorbs oxygen.

Vocabulary

- 3 Scan the text to find verbs that collocate with the nouns and adjective below. Use them to complete the word puzzle. Write all the verbs in their infinitive form. Which verb from the text's title is revealed vertically?

- spoilage (paragraph 1)
- temperature (paragraph 2)
- a product (paragraph 2)
- cool (paragraph 2)
- deterioration (paragraph 3)
- oxygen (paragraph 4)
- the environment (paragraph 5)



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Passives

- 4 Complete the sentences with a verb from the box, writing it in the passive form given in brackets.

be	find	invent	keep	make	relate
use					

EXAMPLE: Food storage (*modal perfect passive*)
must have been very different before the invention of plastics.

- This product (*modal present passive*) fresh for at least two weeks if sealed in plastic and stored in the fridge.
 - Nowadays, many clothes (*present simple passive*) from a blend of cotton and polyester, which is a form of plastic.
 - The story of plastic dates back to 1870, when a material known as celluloid (*past simple passive*)
 - A German study found that 400% more material by weight would need (*passive infinitive*) if plastic did not exist.
 - No correlation (*present perfect passive*) between vinyl manufacturing and cancer.
 - Up to three million full-time jobs in the USA (*present simple passive*) in some way to the plastics industry.
- 5 Finish the second sentences so that they mean the same as the first, using passive forms. The agent with *by* is not always needed.

EXAMPLE: Active packaging keeps food fresh for longer.
 Food is kept fresh for longer by active packaging.

- They are producing more goods in plastic.
 More goods
- Our local council has just introduced a plastics recycling scheme.
 A plastics recycling scheme
- They use plastics in the manufacture of pills.
 Plastics
- They are about to launch a new type of biodegradable plastic bottle.
 A new type of biodegradable plastic bottle
- The factory might shut down its glassmaking division, to concentrate on plastic.
 The factory's glassmaking division
- If someone hadn't invented plastic, what materials would we be using today?
 If plastic